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EXAMINER

SAXENA, AKASH

ART UNIT PAPER NUMBER

2128

DATE MAILED: 04/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

### Period for Reply

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 17 October 2005.  
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-34 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

1. Claim(s) 1-13, 15-30 and 32-34 have been presented for examination based on amendment filed on 17<sup>th</sup> October 2005.
2. A final office action was issued on 10<sup>th</sup> January 2006; Finality of that action is rescinded in view of arguments presented by the applicant in an applicant-initiated interview with SPE (Kamini Shah) on 6<sup>th</sup> February 2006.
3. Examiner has presented more clear response to the arguments/remarks presented by the applicant to further prosecution.
4. The arguments submitted by the applicant have been fully considered. Claims 1-13, 15-30 and 32-34 remain rejected. The examiner's response is as follows.

#### ***Response to Applicant's Remarks & Examiner's Withdrawals***

5. Examiner respectfully withdraws the objection(s) to specification (abstract) in view of the amendment to the abstract.
6. Examiner respectfully withdraws the claim objection(s) to claim(s) 5 in view of the amendment.
7. Objection to the ineffective incorporation is also withdrawn in view of amendment to the specification.
8. *Claim objection to the improper dependent claims 6 and 23 are also withdrawn.*

***Response to Applicant's Remarks for 35 U.S.C. § 103***

9. Claims 1-13, 15-30 and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over article Hong '1998 in view of lizuka '188.

**Regarding Claims 1 & 12**

Applicants states:

Hong merely discloses a computer model for control system design of gasoline engines with an automatic transmission. In addition, the Hong Article provides a modular programming approach with MATLAB/SIMULINK as a programming environment. Furthermore, engine/transmission systems are analyzed in the object-oriented fashion that provides and ensures easy construction of various computer models by assembling various objects. The top level in the powertrain model of the Hong Article consists of three classes: an engine, a transmission, and a driveline, where each class is designed to perform by itself.

lizuka merely discloses a method and system for controlling shift in an automatic transmission that can establish a plurality of gear ratios by selectively supplying a hydraulic pressure for a plurality of frictional engaging elements. For instance, lizuka's disclosure is not concerned with a simulator of the shift control system. lizuka merely discloses that the learning control unit 26 modifies the hydraulic pressure when the shift shock occurs.

Examiner notes the teaching of the Hong as understood by applicant. In regards lizuka '188 reference, applicant argues that lizuka '188 merely teaches method and system of controlling shift in the automatic transmission and does not concern with simulator of shift control system. Hong '1998 addresses this limitation relating to simulator of shift control system (Hong '1998: Abstract). Although the lizuka '188 reference was used to cure the deficiencies of Hong '1998, it also substantially teaches in a system format the algorithmic steps recited in claim 1 (Eg. Hydraulic pressure command to predict the pressure (lizuka '188: Fig.1)). In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

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Applicants states/ argue the limitation:

In making the rejection, the Examiner took the position that the Hong Article discloses substantially all of the elements of the claimed invention with the exception of the limitation "a second simulator section..." The Examiner cited Iizuka for allegedly curing the deficiencies that exist in the Hong Article.

The Applicants respectfully disagree with the Examiner's position and submit that the Hong article generally provides a computer software simulator for the powertrain system, and thus fails to specifically disclose or teach the limitations as follows:

Claims 1 and 12

a first simulator section connected to the control system design tool for inputting the hydraulic pressure supply command and for estimating an effective hydraulic pressure in the hydraulic actuator in response to the hydraulic pressure supply command based on a first model.

Applicant argues that Hong '1998 merely teaches a control design of gasoline engines with an automatic transmission and fails to disclose first simulator as claimed. Examiner respectfully disagrees with the applicant.

Hong '1998 clearly teaches "a first simulator section" as Automatic Transmission control (AT controller module) system, "connected to the control system design tool" as MATLAB /SIMULINK Software tool, "for inputting the hydraulic pressure supply command and for estimating an effective hydraulic pressure in the hydraulic actuator" as inputting hydraulic pressure supply command the command based on the shift schedule (Hong '1998: Pg.113 CONTROLLER MODULE AT Controller Module), "for estimating an effective hydraulic pressure in the hydraulic actuator in response to the hydraulic pressure supply command based on a first model" as estimating the hydraulic pressure in various gear plates in various profiles based on the shift schedule (Hong '1998: indicated by the Eqs.3 (a-c)).

Further, Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes

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them from the references. Portions of the claims 1 & 12 are merely restated without specifically pointing out how the first simulator section is novel from disclosed prior arts.

Regarding Claim 18 and 29

Applicants states/ argue the limitation as not being taught by Hong:

Claims 18 and 29

(b) inputting the hydraulic pressure supply command and estimating an effective hydraulic pressure generated in the hydraulic actuator in response to the hydraulic pressure supply command based on a first model.

Hong teaches the above limitation as inputting the shift schedule, which in turn generates hydraulic pressure supply command and estimates the hydraulic pressure (Hong '1998: indicated by the Eqs.3 (a-c); Further based on shift schedule proportional to vehicle speed and throttle angle). Although Iizuka is not used for rejection, Iizuka explains how the shift schedule is associated to the hydraulic pressure supply command generation in a modern automatic transmission as common known in the art of designing automatic transmission (Iizuka: Col.5 Lines 46-Col.6 Line 12)

Regarding Claim 1 Again:

Claim 1

a second simulator section connected to the control system design tool and to the first simulator section for determining transfer functions of a second model describing behavior of the hydraulic actuator such that an output of the second model converges with the estimated effective hydraulic pressure, wherein the second simulator section simulates and evaluates the shift control algorithm based on a third model obtained by incorporating the second model with the first model.

Applicants argue that neither Hong nor Iizuka teach the above limitation is. Examiner respectfully disagrees. As shown above Hong teaches the first model. Iizuka teaches "a second simulator section connected to the control system design tool" a second

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simulator section as a learning control section on a CPU (lizuka '188: Col.6, Lines 13-16; Fig.1, Elements 26-28), and "to the first simulator section for determining transfer functions of a second model describing behavior of the hydraulic actuator", as determining the transfer functions ( $\alpha_1$ )(lizuka '188: Col.6, Lines 30-42) ( $\alpha_2$ ) (lizuka '188: Col.6, Lines 42-29) between the first model (by Hong) and the second model (by lizuka). lizuka '188 teaches "such that an output of the second model converges with the estimated effective hydraulic pressure" as convergence of the estimated hydraulic pressure with the one predicted by the model (lizuka '188: Col.1, Lines 28-37). The "convergence" is understood to be the convergence between the first model and second model hydraulic pressure using the transfer function as defined and rejected above.

The limitation "wherein the second simulator section simulates and evaluates the shift control algorithm based on a third model obtained by incorporating the second model with the first model.", is taught by lizuka '188 as method for running the converged automatic transmission system (lizuka '188: Fig.1, Elements 26 & 13). The third model is obvious as combined or converged first and second models generate a converged hydraulic pressure (functionally the output of the third model). Examiner asserts that this extended explanation maps each and every element of this claim.

Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references. Applicant's argument regarding establishing a prima facie

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case of obviousness are considered and are found to be unpersuasive. Portions of the claims 1, 7, 12, 18, 24 and 29 are merely restated without specifically pointing out how the claimed invention is novel from disclosed prior arts.

Regarding Claims 7, 12, 18, 24 and 29

A clear rejection for claims 7, 12, 18, 24 and 29 is presented below pointing out every element.

**Rational for combining Hong '1998 and Iizuka '188:**

The examiner contends that the motivation to combine Hong '1998 and Iizuka '188 is proper and in accordance with MPEP guidelines for the following reasons. MPEP 2143.01 Suggestion or Motivation To Modify the References first recites:

"There are three possible sources for a motivation to combine references: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art." In re Rouffet, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998)

In this case the examiners rejection first addresses the nature of the problem to be solved, namely, simulating the shift control algorithm with prediction of hydraulic pressure, relative to the teachings in the prior art.

Prior art, Hong '1998 clearly teaches a Automatic transmission control system estimating an effective hydraulic pressure based on the hydraulic pressure supply command (Hong '1998: Pg.113) which estimates the hydraulic pressure in various profiles (Hong '1998: indicated by the Eqs.3 (a-c)). Prior art, Iizuka '188 also clearly is concerned with accurate prediction and correction of the hydraulic pressure (Iizuka '188: Fig.1).

Teaching of Hong '1998 and Iizuka '188 clearly point to modification and combination with each other and are not provided as a suggestion that these references can be arguably combined. For example Hong '1998 clearly teaches that the simulator model shown can be run with the real time control (system) and hardware-in-loop simulation (Hong '1998: Pg. 117 Conclusions). On the other hand, Iizuka '188 clearly uses a learning control (modeling and prediction component) to predict and correct the hydraulic pressure (Iizuka '188: Fig.1 Elements 13 & 26).

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*Applicant's argument regarding establishing a prima facie case of obviousness are considered and are found to be unpersuasive.*

Further, MPEP 2144 Sources of Rationale Supporting a Rejection Under 35 U.S.C.

103 recites:

"The rationale to modify or combine the prior art does not have to be expressly stated in the prior art; the rationale may be expressly or impliedly contained in the prior art or it may be reasoned from knowledge generally available to one of ordinary skill in the art, established scientific principles, or legal precedent established by prior case law. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). See also In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000) (setting forth test for implicit teachings); In re Eli Lilly & Co., 902 F.2d 943, 14 USPQ2d 1741 (Fed. Cir. 1990) (discussion of reliance on legal precedent); In re Nilssen, 851 F.2d 1401, 1403, 7 USPQ2d 1500, 1502 (Fed. Cir. 1988) (references do not have to explicitly suggest combining teachings)"

The examiner has simply asserted that a skilled artisan tasked with solving the problem of modeling a simulator (i.e. as taught by Hong '1998) to predict (and or correcting) the hydraulic pressure during the shifting of gears in an automatic transmission would have to use a reference value and a measured value and some model to converge the two values (i.e. as taught by Iizuka '188). Specifically, a skilled artisan working in this obviously competitive environment would have made an effort to become aware of what capabilities had already been developed in the market place, and hence would have been aware of, and known to seek out the relative teachings of the problem to be solved. Namely, the teachings of Hong '1998 and Iizuka '188.

MPEP 2143.01 Suggestion or Motivation To Modify the References further recites the following supporting rationale:

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in

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the knowledge generally available to one of ordinary skill in the art. "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000).

The examiner therefore appears to have established an implicit showing that in view of the combined teachings of the prior art, the relative knowledge of one skilled in the art, and in particular, the nature of the problem to be solved, there exists an obvious motivation to combine the references as noted above.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**10. Claim 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over article "Object-Oriented Modeling for Gasoline Engine and Automatic Transmission Systems" by K. Hong et al. (Hong '1998 hereafter) in view of U.S. Patent No. 5,885,188 issued to Naonori Iizuka (Iizuka '188 hereafter).**

Regarding Claim 1

Hong '1998 teaches

"A simulator having computer-aided design programs for simulating a shift control algorithm stored in a shift controller of an automatic transmission mounted on a vehicle, said vehicle having a hydraulic actuator to transmit power generated by an internal combustion engine to drive wheels based on at least throttle opening and vehicle speed in accordance with the shift control algorithm, comprising; ... "

as a MATLAB/SIMULINK simulator (Hong '1998: Pg.109), simulating a shift control algorithm (Hong '1998: Pg.109, Abstract) for shift controller of an automatic transmission for a vehicle with internal combustion engine (Hong '1998: Abstract) based on the at least throttle opening and vehicle speed (Hong '1998: Page 114).

Further, Hong '1998 teaches

"a control system design tool connected to the shift controller for inputting the shift control algorithm and for outputting a hydraulic pressure supply command such that the hydraulic pressure supply command is supplied to the hydraulic actuator through the hydraulic circuit based on a shift signal from shift control algorithm;..."

as MATLAB/SIMULINK Tool (Hong '1998: Pg.109, Abstract) which can be connected to the shift controller (Hong '1998: Page 108, 3<sup>rd</sup> Paragraph) to input the algorithm which outputs the hydraulic pressure supply command based on the algorithm (Hong '1998: Pg.109, Abstract). The hydraulic circuits & actuator are taught by Hong as disclosed (Hong: Fig.1 Element 20, 23-25).

Further, Hong '1998 teaches

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"a first simulator section connected to the control system design tool for inputting the hydraulic pressure supply command for estimating an effective hydraulic pressure generated in the hydraulic actuator in response to the hydraulic pressure supply command based on a first model; ..."

As a first simulator to input the hydraulic pressure supply command (Hong '1998: Pg.113, "AT Controller Module") which estimates an effective hydraulic pressure based on the first model (Hong '1998: Pg.109 3<sup>rd</sup> Paragraph and AT module).

Hong '1998 does not teach a second model describing the behavior of hydraulic actuator such that first and second model converge.

Iizuka '188 teaches

"and a second simulator section which is connected to the control system design tool and the first simulator section for determining transfer functions of a second model describing behavior of the hydraulic actuator such that an output of the second model converges with the estimated effective hydraulic pressure; wherein the second simulator section simulates and evaluates the shift control algorithm based on a third model obtained by incorporating the second model with the first model."

as a second simulator section as a learning control section on a CPU (Iizuka '188:

Col.6, Lines 13-16; Fig.1, Elements 26-28) which determines the transfer functions

( $\alpha_1$ )(Iizuka '188: Col.6, Lines 30-42) ( $\alpha_2$ ) (Iizuka '188: Col.6, Lines 42-29).

Iizuka '188 teaches convergence of the estimated hydraulic pressure with the one predicted with the model (Iizuka '188: Col.1, Lines 28-37). Further, Iizuka '188

teaches a method for running the converged automatic transmission system (Iizuka '188: Fig.1, Elements 26 & 13). The third model is obvious as combined or

converged first and second models generate a converged hydraulic pressure

(functionally the output of the third model) for simulating the converged automatic transmission system (Iizuka '188: Fig.1, Elements 26 & 13).

It would have been obvious to one (e.g. a designer) of ordinary skill in the art at the time the invention was made to combine the teachings of Iizuka '188 with Hong '1998 to create a converged model simulator for an automatic transmission controller describing the behavior of hydraulic actuator. The motivation would have been that Iizuka '188 solving the problem of correctly predicting the hydraulic pressure & storing it in the map or the like (Iizuka '188: Col.1, Lines 28-37). Further motivation comes from Hong '1998 as he considers modeling the clutch pressure to be complex for the complete system model (first simulation) and estimates the clutch pressure with equations 3(a), (b), (c) (Hong '1998: Pg.114), but goes on to teach that entire model or parts of it can be modified to be included in the entire model leading to reduced programming effort (Hong '1998: Pg.109, Paragraph 2). Thus both references provide motivation towards each other to improve the model of the automatic transmission system for simulation purposes.

#### Regarding Claim 2

Teachings of Hong '1998 are disclosed in the claim 1 rejection above. Hong '1998 does not teach a host computer for storing data for determining the transfer function by retrieving the data with a predetermined parameter.

Iizuka '188 teaches a host computer (Iizuka '188:Col.6, Lines 12-15) for storing the mechanism for the transfer function (shifting period storage portion) (Iizuka '188: Col.6, Lines 30-42) based on the predetermined parameter (target shifting period based on the predetermined driving conditions) (Iizuka '188: Col.6, Lines 35-37).

Regarding Claim 3

Teachings of Hong '1998 are disclosed in the claim 1 rejection above. Hong '1998 does not teach transfer function as being a predetermined time period after which the output of second model beings to increase.

lizuka '188 teaches a transfer function (shifting period storage portion) (lizuka '188: Col.6, Lines 30-42) drives the output of based on aforementioned time (lizuka '188: Col.6, Lines 42-49).

Regarding Claim 4

Teachings of Hong '1998 are disclosed in the claim 1 rejection above. lizuka '188 teaches that the output is generated whenever the input value is exceeding the predetermined period of time (lizuka '188: Col.6, Lines 35-49).

Regarding Claim 5

Teachings of Hong '1998 are disclosed in the claim 1 rejection above. lizuka '188 teaches a second transfer function to converge with estimated hydraulic pressure (lizuka '188: Col.6, Lines 42-49).

Regarding Claim 6

Teachings of Hong '1998 are disclosed in the claim 2 rejections above. lizuka '188 teaches the predetermined parameter is hydraulic supply command and shift interval (lizuka '188: Fig.1, Elements 20,25,26; Col.5, Lines 60-67; Col.6, Lines 30-49).

**11. Claim 7-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over article “Object-Oriented Modeling for Gasoline Engine and Automatic Transmission Systems” by K. Hong et al. (Hong hereafter) in view of U.S. Patent No. 5,885,188 issued to Naonori Iizuka (Iizuka hereafter), further in view of “Design of Computer Experiments for Open-Loop Control and Robustness Analysis of Clutch to Clutch Shifts in Automatic Transmission” by Albert Yoon et al (Yoon hereafter).**

Regarding Claim 7

Claim 7 presents similar limitations of problem description as claim 1 and is rejected for the same reasons in most part as claim 1. More specifically, besides the teachings presented by Hong and Iizuka above claims is further rejected as follows.

Iizuka teaches “transmission characteristic analyzing means (Specification: Fig.24) for analyzing characteristics of the transmission when shift is conducted in accordance with the shift control algorithm through a value to determine deviation of the characteristics from a predetermined standard” as deviation analysis between the actual shifting period and target shifting period and “parameter extraction means” to measure/derive the shift period difference (Iizuka: Col.6 Lines 30-49; Col.5, Lines 46-59).

Further, Iizuka '188 teaches that the shifting period have impact on the shift shock and hence durability of the transmission (Iizuka: Col.1, Lines 21-36). Hence parameter extraction means to get the correct shifting period can be extracted from the system (model) based on the learning system (Iizuka: Fig.1, Elements 26-28).

Further, lizuka '188 teaches that the learning system can correct the shifting period ("correcting means") if there are any anomalies (lizuka: Col.2, Lines 50-57).

As seen above lizuka is concerned with the avoiding undesirable shift condition by coming up with the best possible shifting period, however lizuka does not appear to teach the forecasting the undesirable shift phenomenon using simulation. Hong also does not explicitly teach such a phenomenon.

The undesirable shift phenomenon means as understood, is the ineffective clutch pressures due to various shifting period on each incoming and off going clutches, leading to racing or spike in the engine speed (Specification: Fig: 31).

Yoon is a simulation system concerned with avoiding this undesirable shift condition based on a model based on the changing parameters like clutch plate friction co-efficient and clutch cavity fill delay and finding bounds of these parameters (Yoon: Pg.3360 Section 2.2 ¶1 –Problem description of undesirable shifting phenomenon; Section 2.2 ¶2 – Modeling, parameter bound identification).

It would have been obvious to one (e.g. a designer) of ordinary skill in the art at the time the invention was made to combine the teachings of lizuka '188 with Hong '1998 to create a converged model simulator for an automatic transmission controller describing the behavior of hydraulic actuator. The motivation would have been that lizuka '188 solving the problem of correctly predicting the hydraulic pressure & storing it in the map or the like (lizuka '188: Col.1, Lines 28-37). Further motivation comes from Hong '1998 as he considers modeling the clutch pressure to be complex for the complete system model (first simulation) and estimates the clutch pressure

with equations 3(a), (b), (c) (Hong '1998: Pg.114), but goes on to teach that entire model or parts of it can be modified to be included in the entire model leading to reduced programming effort (Hong '1998: Pg.109, Paragraph 2). Thus both references provide motivation towards each other to improve the model of the automatic transmission system for simulation purposes. Motivation to combine Iizuka to Hong is detailed above as **"Rational for combining Hong '1998 and Iizuka '188"**.

It would have been obvious to one (e.g. a designer) of ordinary skill in the art at the time the invention was made to combine the teachings of Yoon with Hong-Iizuka to create a converged hardware in loop model simulator (HILS) for an automatic transmission controller describing the behavior of hydraulic actuator. Hong considers the exact mechanics of clutch pressure modeling to be very complex and models them as simple equation (Hong '1998: indicated by the Eqs.3 (a-c)) and Iizuka uses a model and map based learning solution to obtain the optimum solution for shifting period (critical timing parameter determining the quality of shift). Neither of them addresses the core reason for difference between the actual shifting period and corrected shifting period. Yoon corrects this deficiency by modeling the clutch-to-clutch handoff thereby establishing bounds for actual parameter (clutch plate friction co-efficient and clutch cavity fill delay among other parameters) (Yoon: Section 4.1, 4.3; Section 5) that cause the shifting period to vary. It would be highly beneficial to run such a simulation with these parameters included in the algorithm (or in learning

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portion of lizuka's model) for accurate prediction of shifting period in the automatic transmission.

Regarding Claim 8

lizuka '188 teaches repeating as the process for correct shifting and hydraulic pressure values (lizuka '188: Col.8 Lines 17-29; 62-67; Col.9 Lines 1-8).

Regarding Claim 9

The behavior of the model, i.e. how the output should be optimized through the model, is stored (lizuka '188: Col.6, Lines 30-45).

Regarding Claim 10

lizuka '188 teaches at least part of the shift control algorithm is based on the forecast (lizuka '188 Col.6, Lines) in form of a map.

Regarding Claim 11

lizuka '188 teaches that automatic transmission fluid temperature is at least one of the parameters (lizuka '188: Col.8, Lines 3-16).

Regarding Claim 12

Hong '1998 teaches

"A simulator having computer-aided design programs for simulating a shift control algorithm stored in a shift controller of an automatic transmission mounted on a vehicle and having a hydraulic actuator to transmit power generated by an internal combustion engine to drive wheels based on at least throttle opening and vehicle speed in accordance with the shift control algorithm, comprising; ... "

as a MATLAB/SIMULINK simulator (Hong '1998: Pg.109), simulating a shift control algorithm (Hong '1998: Pg.109, Abstract) for shift controller of an automatic transmission for a vehicle with internal combustion engine (Hong '1998: Abstract) based on the at least throttle opening and vehicle speed (Hong '1998: Page 114).

Further, Hong '1998 teaches

"a control system design tool which is connected to the shift controller to inputs the shift control algorithm and which outputs a hydraulic pressure supply command based on the inputted shift control algorithm;..."

as MATLAB/SIMULINK Tool (Hong '1998: Pg.109, Abstract) which can be connected to the shift controller (Hong '1998: Page 108, 3<sup>rd</sup> Paragraph) to input the algorithm which outputs the hydraulic pressure supply command based on the algorithm (Hong '1998: Pg.109, Abstract).

Further, Hong clearly teaching "a first simulator section" as Automatic Transmission control (AT controller module) system, "connected to the control system design tool" as MATLAB /SIMULINK Software tool, "for inputting the hydraulic pressure supply command and for estimating an effective hydraulic pressure in the hydraulic actuator" as inputting hydraulic pressure supply command the command based on the shift schedule (Hong '1998: Pg.113 CONTROLLER MODULE AT Controller Module), "for estimating an effective hydraulic pressure in the hydraulic actuator in response to the hydraulic pressure supply command

based on a first model" as estimating the hydraulic pressure in various gear plates in various profiles based on the shift schedule (Hong '1998: indicated by the Eqs.3 (a-c)).

Hong '1998 does not teach a second model describing the behavior of hydraulic actuator such that first and second model converge.

lizuka teaches "a second simulator section connected to the control system design tool" a second simulator section as a learning control section on a CPU (lizuka '188: Col.6, Lines 13-16; Fig.1, Elements 26-28), and "to the first simulator section for determining transfer functions of a second model describing behavior of the hydraulic actuator", as determining the transfer functions ( $\alpha_1$ )(lizuka '188: Col.6, Lines 30-42) ( $\alpha_2$ ) (lizuka '188: Col.6, Lines 42-29) between the first model (by Hong) and the second model (by lizuka). lizuka '188 teaches "such that an output of the second model converges with the estimated effective hydraulic pressure" as convergence of the estimated hydraulic pressure with the one predicted by the model (lizuka '188: Col.1, Lines 28-37). The "convergence" is understood to be the convergence between the first model and second model hydraulic pressure using the transfer function as defined and rejected above.

The limitation "wherein the second simulator section simulates and evaluates the shift control algorithm based on a third model obtained by incorporating the second model with the first model.", is taught by lizuka '188 as method for running the converged automatic transmission system (lizuka '188: Fig.1, Elements 26 & 13). The third model is obvious as

combined or converged first and second models generate a converged hydraulic pressure (functionally the output of the third model).

lizuka teaches "transmission characteristic analyzing means (Specification: Fig.24) for analyzing characteristics of the transmission when shift is conducted in accordance with the shift control algorithm through a value to determine deviation of the characteristics from a predetermined standard" as deviation analysis between the actual shifting period and target shifting period and "parameter extraction means" to measure/derive the shift period difference (lizuka: Col.6 Lines 30-49; Col.5, Lines 46-59).

Further, lizuka '188 teaches that the shifting period have impact on the shift shock and hence durability of the transmission (lizuka: Col.1, Lines 21-36). Hence parameter extraction means to get the correct shifting period can be extracted from the system (model) based on the learning system (lizuka: Fig.1, Elements 26-28). Further, lizuka '188 teaches that the "learning system can correct the shifting period" ("correcting means") if there are any anomalies (lizuka: Col.2, Lines 50-57).

As seen above lizuka is concerned with the avoiding undesirable shift condition by coming up with the best possible shifting period, however lizuka does not appear to teach the forecasting the undesirable shift phenomenon using simulation. Hong also does not explicitly teach such a phenomenon.

The "undesirable shift phenomenon means" as understood, is the ineffective clutch pressures due to various shifting period on each incoming and off going clutches, leading to racing or spike in the engine speed (Specification: Fig: 31).

Yoon is a simulation system concerned with avoiding this undesirable shift condition based on a model based on the changing parameters like clutch plate

friction co-efficient and clutch cavity fill delay and finding bounds of these parameters (Yoon: Pg.3360 Section 2.2 ¶1 –Problem description of undesirable shifting phenomenon; Section 2.2 ¶2 – Modeling, parameter bound identification). Yoon also teaches the “parameter extraction means” in Fig.3 (Yoon: Pg.3362).

Motivation to combine lizuka with Hong is provided in the previous office action claim 1 and further detailed above as “**Rational for combining Hong ‘1998 and lizuka ‘188**”.

It would have been obvious to one (e.g. a designer) of ordinary skill in the art at the time the invention was made to combine the teachings of Yoon with Hong-lizuka to create a converged hardware in loop model simulator (HILS) for an automatic transmission controller describing the behavior of hydraulic actuator. Hong considers the exact mechanics of clutch pressure modeling to be very complex and models them as simple equation (Hong ‘1998: indicated by the Eqs.3 (a-c)) and lizuka uses a model and map based learning solution to obtain the optimum solution for shifting period (critical timing parameter determining the quality of shift). Neither of them addresses the core reason for difference between the actual shifting period and corrected shifting period. Yoon corrects this deficiency by modeling the clutch-to-clutch handoff thereby establishing bounds for actual parameter (clutch plate friction co-efficient and clutch cavity fill delay among other parameters) (Yoon: Section 4.1, 4.3; Section 5) that cause the shifting period to vary. It would be highly beneficial to run such a simulation with these parameters included in the algorithm (or in learning

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portion of Iizuka's model) for accurate prediction of shifting period in the automatic transmission.

Regarding Claim 13

Claim 13 discloses the same limitations as claim 8 and is rejected for the same reasons as claim 8.

Regarding Claim 15

Claim 15 discloses the same limitations as claim 9 and is rejected for the same reasons as claim 9.

Regarding Claim 16

Claim 16 discloses the same limitations as claim 10 and is rejected for the same reasons as claim 10.

Regarding Claim 17

Claim 17 discloses the same limitations as claim 11 and is rejected for the same reasons as claim 11.

Regarding Claim 18

Claim 18 discloses the same limitations as claim 1 and is rejected for the same reasons as claim 1. It was pointed out that steps (c) and (d) were not clearly taught by Hong and Iizuka. Iizuka teaches step (c) transfer function as "hydraulic pressure correction value setting portion 31" to converge with estimated hydraulic pressure (Iizuka '188: Col.6, Lines 42-49; Col.4 Lines 16-22). Iizuka teaches step (d) as method for simulating shift control algorithm for converged automatic transmission system (Iizuka '188: Fig.1, Elements 26 & 13). The third model is obvious as combined or converged first and second models generate a converged hydraulic pressure (functionally the output of the third model).

Regarding Claim 19

Claim 19 discloses the same limitations as claim 2 and is rejected for the same reasons as claim 2.

Regarding Claim 20

Claim 20 discloses the same limitations as claim 3 and is rejected for the same reasons as claim 3.

Regarding Claim 21

Claim 21 discloses the same limitations as claim 4 and is rejected for the same reasons as claim 4.

Regarding Claim 22

Claim 22 discloses the same limitations as claim 5 and is rejected for the same reasons as claim 5.

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Regarding Claim 23

Claim 23 discloses the same limitations as claim 6 and is rejected for the same reasons as claim 6.

Regarding Claim 24

Claim 24 discloses the same limitations without “means for language”, as in claim 7 and is rejected for the same reasons as claim 7 above.

Regarding Claim 25

Claim 25 discloses the same limitations as claim 8 and is rejected for the same reasons as claim 8.

Regarding Claim 26

Claim 26 discloses the same limitations as claim 9 and is rejected for the same reasons as claim 9.

Regarding Claim 27

Claim 27 discloses the same limitations as claim 10 and is rejected for the same reasons as claim 10.

Regarding Claim 28

Claim 28 discloses the same limitations as claim 11 and is rejected for the same reasons as claim 11.

Regarding Claim 29

Hong teaches

"A method for simulating a shift control algorithm stored in a shift controller of an automatic transmission mounted on a vehicle and said vehicle having a hydraulic actuator to transmit power generated by an internal combustion engine to drive wheels based on at least throttle opening and vehicle speed in accordance with the shift control algorithm, said method comprising steps of; ... "

as a MATLAB/SIMULINK simulator (Hong '1998: Pg.109), simulating a shift control algorithm (Hong '1998: Pg.109, Abstract) for shift controller of an automatic transmission for a vehicle with internal combustion engine (Hong '1998: Abstract) based on the at least throttle opening and vehicle speed (Hong '1998: Page 114).

Hong & Iizuka teach

(a) inputting the shift control algorithm to output a hydraulic pressure supply command to be supplied to the hydraulic actuator through a hydraulic circuit based on a shift signal in the inputted shift control algorithm;

as inputting hydraulic pressure supply command the command based on the shift schedule (Hong '1998: Pg.113 CONTROLLER MODULE AT Controller Module).

Iizuka also teaches inputting the hydraulic pressure supply command the command based on the shift schedule (Iizuka: Fig.1 Element 20 & 24).

Hong teaches

(b) inputting the hydraulic pressure supply command and estimating an effective hydraulic pressure generated in the hydraulic actuator in response to the hydraulic pressure supply command based on a first model describing entire system including the transmission, and

as estimating the hydraulic pressure in various gear plates in various profiles based on the shift schedule (Hong '1998: indicated by the Eqs.3 (a-c)).

Hong does not teach a limitations pertaining to the second model.

lizuka teaches

(c) determining transfer functions of a second model describing behavior of the hydraulic actuator such that an output of the second model converges with the estimated effective hydraulic pressure, and simulating and evaluating the shift control algorithm based on a third model obtained by incorporating the second model with the hydraulic circuit of the first model,

as determining the transfer functions ( $\alpha_1$ )(lizuka '188: Col.6, Lines 30-42)

( $\alpha_2$ ) (lizuka '188: Col.6, Lines 42-29) between the first model (by Hong) and the

second model (by lizuka). lizuka '188 teaches "output of the second model converges with

the estimated effective hydraulic pressure" as convergence of the estimated hydraulic

pressure with the one predicted by the model (lizuka '188: Col.1, Lines 28-37). The

"convergence" is understood to be the convergence between the first model and

second model hydraulic pressure using the transfer function. The limitation,

"simulating and evaluating the shift control algorithm based on a third model obtained by

incorporating the second model with the hydraulic circuit of the first model," is taught by lizuka

'188 as method for running the converged automatic transmission system (lizuka

'188: Fig.1, Elements 26 & 13). The third model is obvious as combined or

converged first and second models generate a converged hydraulic pressure

(functionally the output of the third model).

lizuka & Yoon teach

(d) analyzing accordance with the shift control algorithm through a value to determine deviation of the characteristics from a predetermined standard; characteristics of the transmission when shift is conducted in

(e) extracting a parameter having influence on the characteristics when durability of the transmission is degraded.

as deviation analysis between the actual shifting period and target shifting period

and "parameter extraction" to measure/derive the shit period difference (lizuka: Col.6

Lines 30-49; Col.5, Lines 46-59). Yoon also teaches the "parameter extraction" in Fig.3 (Yoon: Pg.3362; 3363: section 5).

lizuka teaches

(f) conducting simulation based on the third model, while changing the parameter and forecasting occurrence of undesirable phenomenon using the value based on behavior change of the third model; and

as performing the simulation based on the third converged model. lizuka does not explicitly teach changing the parameters and forecasting "undesirable shift phenomenon" using the behavior change in the third model.

Yoon is a simulation system concerned with avoiding this undesirable shift condition based on a model based on the changing parameters like clutch plate friction coefficient and clutch cavity fill delay and finding bounds of these parameters (Yoon: Pg.3360 Section 2.2 ¶1 –Problem description of undesirable shifting phenomenon; Section 2.2 ¶2 – Modeling, parameter bound identification).

(g) correcting the shift control algorithm based on a result of forecasting.

As for step (g), lizuka teaches correcting algorithm with learning process for correct shifting period, although this is not based on the forecasting performed by Yoon. It would be obvious to one of ordinary skill in the art run such a simulation with these parameters included in the algorithm (or in learning portion of lizuka's model) for accurate prediction of shifting period in the automatic transmission. Yoon supplements the generalization about the shifting period by a specific model and parameter calculation through simulation (Yoon: Section: 2.3, 4 & 5).

Motivation to combine Hong, lizuka and Yoon is provided in the claim 7 above.

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Regarding Claim 30

Claim 30 discloses the same limitations as claim 8 and is rejected for the same reasons as claim 8.

Regarding Claim 32

Claim 32 discloses the same limitations as claim 9 and is rejected for the same reasons as claim 9.

Regarding Claim 33

Claim 33 discloses the same limitations as claim 10 and is rejected for the same reasons as claim 10.

Regarding Claim 34

Claim 34 discloses the same limitations as claim 11 and is rejected for the same reasons as claim 11.

***Conclusion***

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

1.

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**Communication**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Akash Saxena whose telephone number is (571) 272-8351. The examiner can normally be reached on 9:30 - 6:00 PM M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamini S. Shah can be reached on (571)272-2279. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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(571) 272-8351  
Friday, April 07, 2006

  
PRIMARY EXAMINER